

Update on the Data Analysis for the Bonn Teststation

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PANDA LV. Collaboration Meeting 2015-12-01

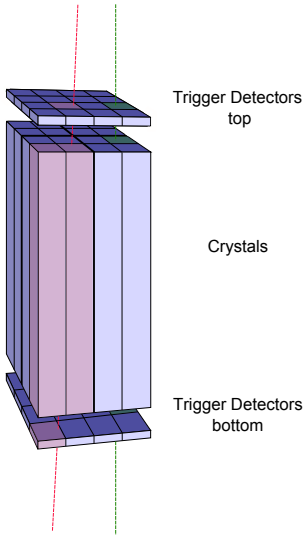
Motivation

Different track types

Analysis
Method I
Method II
Method III

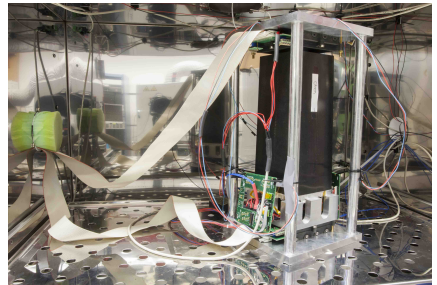
Results

Summary



Motivation

- Each detector submodule needs to be tested and calibrated
- Measurement with cosmics



Track type 0

Motivation

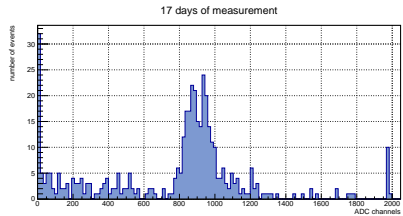
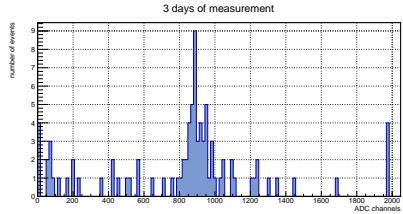
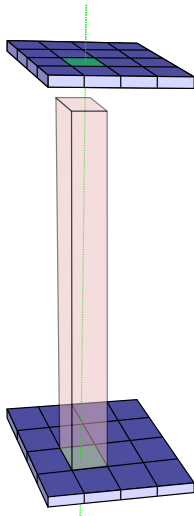
Different track types

Analysis

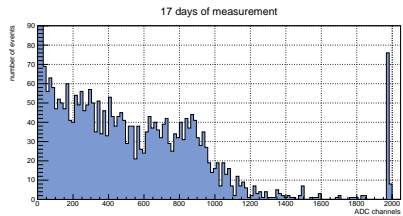
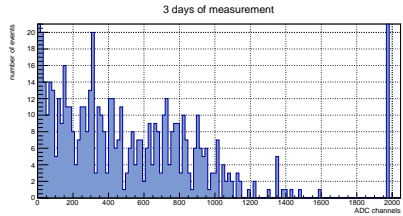
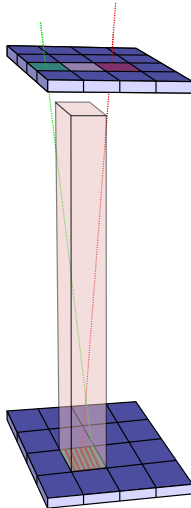
Method I
Method II
Method III

Results

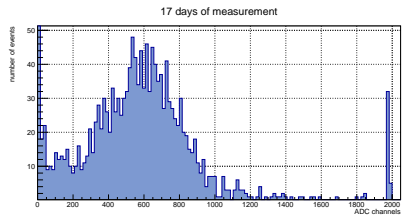
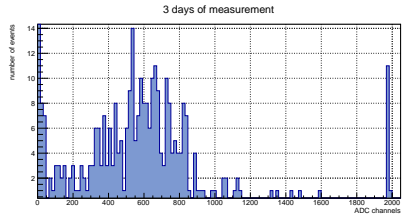
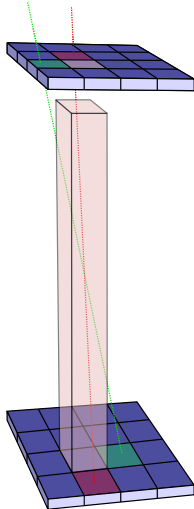
Summary



Track type 1

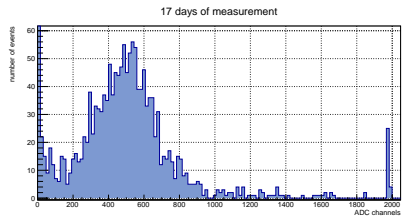
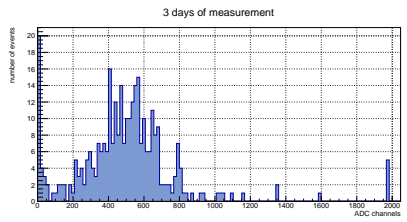
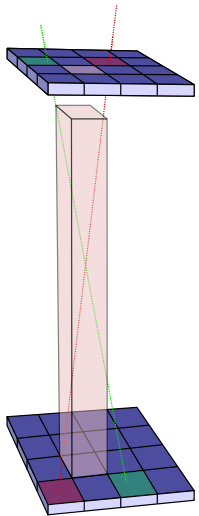


Track type 2

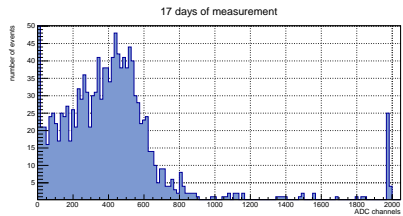
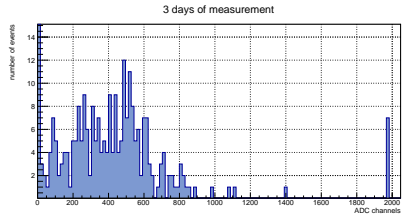
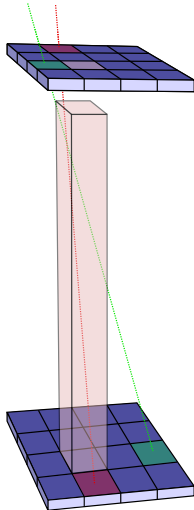


Track type 3

- Motivation
- Different track types**
- Analysis
 - Method I
 - Method II
 - Method III
- Results
- Summary

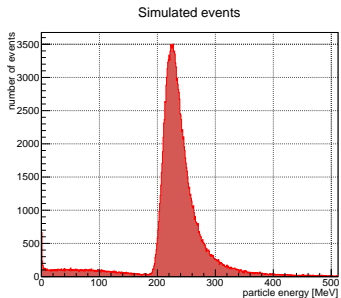
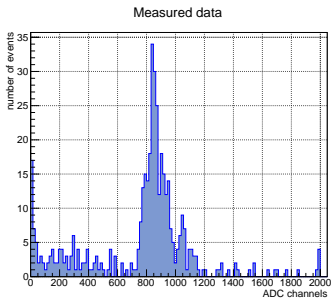


Track type 4



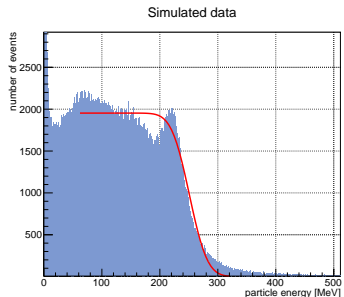
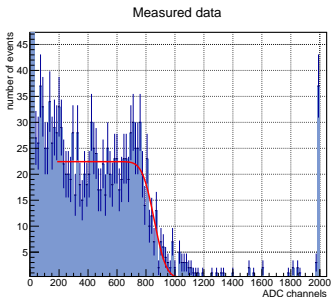
Goal of the analysis

- Compare measured and simulated data to obtain pre-calibration for each of the crystal channels
- Find a conversion from ADC bin to energy [MeV]



Method I

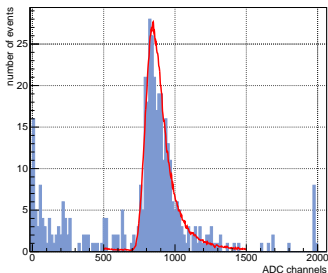
- Fitting functions to measured and simulated data
- Compare peak values of different tracks
- Do linear regression through different points



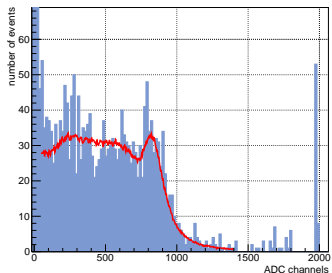
Method II

- Fit simulated spectra directly to measured histograms
- Get mean of different calibration factors

Track type 0



Track type 1



Method III: Log Likelihood

Motivation

Different track types

Analysis

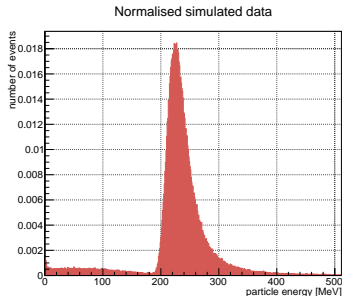
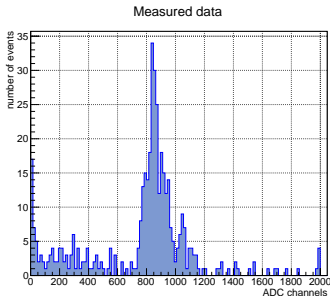
Method I

Method II

Method III

Results

Summary



Binned Log Likelihood fit

1. Vary scaling factor of simulated data to measured one
2. Get a measure for each of the scaling factors and find the best $L = -\sum_b \mathbf{b}_{\text{meas}} \cdot \log(P_{\text{sim}}(\mathbf{b}, x_{\text{scale}}))$

1. varying scaling factor

Motivation

Different track types

Analysis

Method I

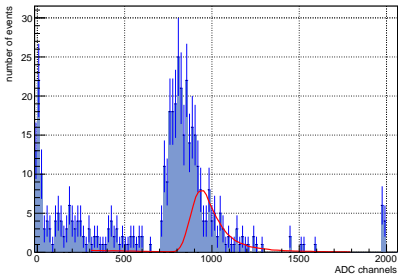
Method II

Method III

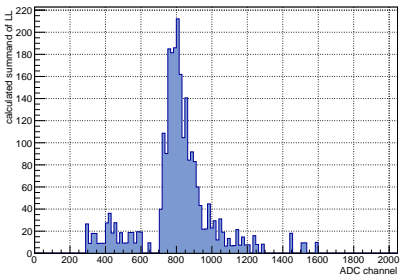
Results

Summary

Result for scaling = 0.239150



LL sum result is 2496.213135



1. varying scaling factor

Motivation

Different track types

Analysis

Method I

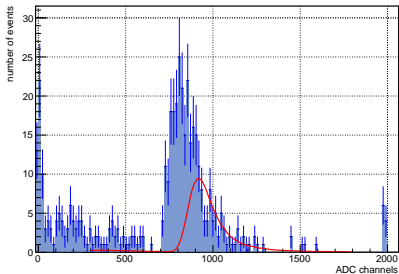
Method II

Method III

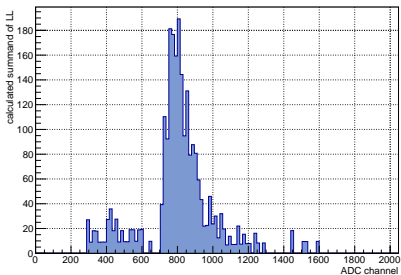
Results

Summary

Result for scaling = 0.244330

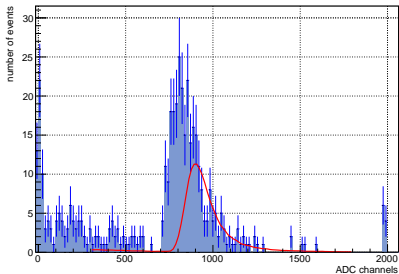


LL sum result is 2401.375488

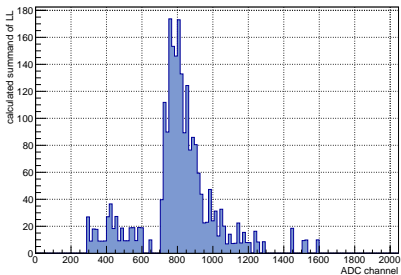


1. varying scaling factor

Result for scaling = 0.248770



LL sum result is 2321.131348



1. varying scaling factor

Motivation

Different track types

Analysis

Method I

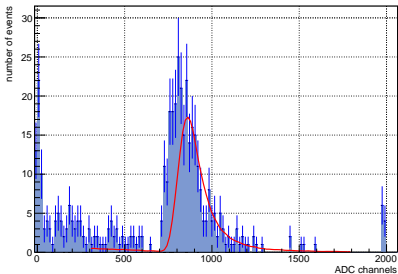
Method II

Method III

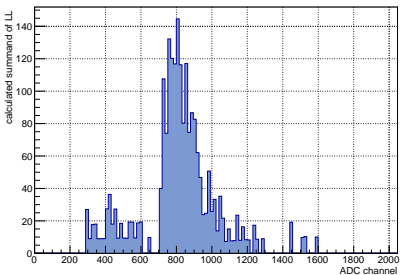
Results

Summary

Result for scaling = 0.260610



LL sum result is 2166.986816



1. varying scaling factor

Motivation

Different track types

Analysis

Method I

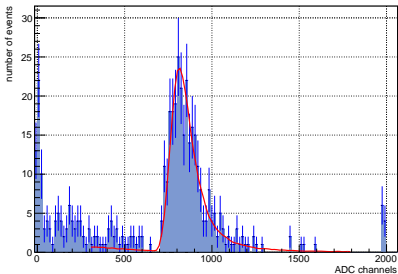
Method II

Method III

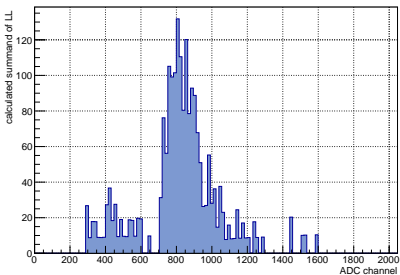
Results

Summary

Result for scaling = 0.275410



LL sum result is 2083.896484



Measure for quality

Motivation

Different track types

Analysis

Method I

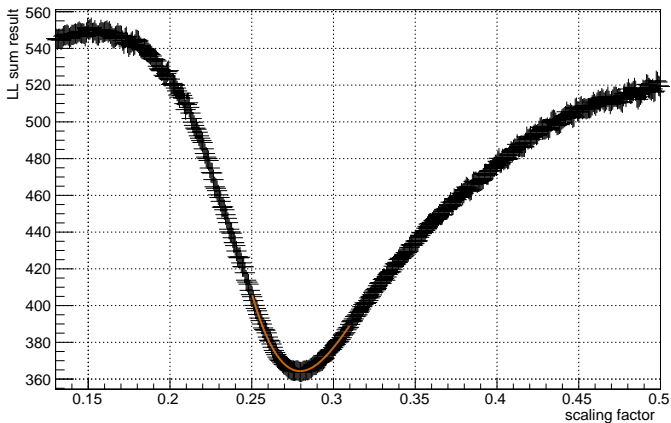
Method II

Method III

Results

Summary

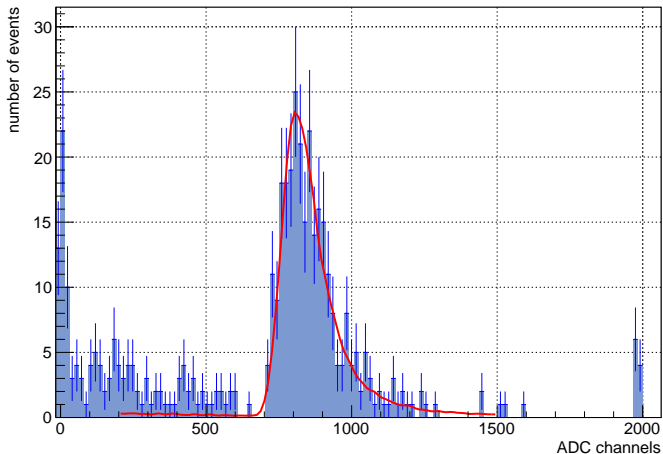
Track type 0



Minimum found at $0.2784 \frac{\text{MeV}}{\text{ADC ch}}$

Visual check of parameter

Resulting visualised fit result



Minimum found at $0.2784 \frac{\text{MeV}}{\text{ADC ch}}$

For all track types

Motivation

Different track types

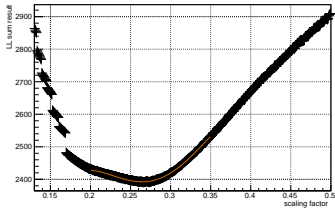
Analysis

Method I
Method II
Method III

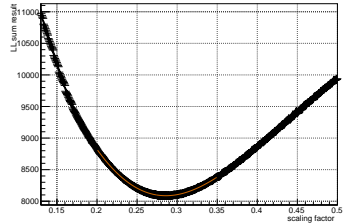
Results

Summary

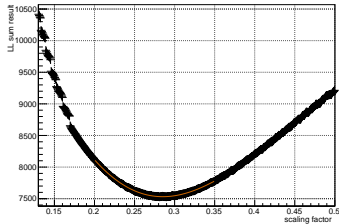
Track type 1



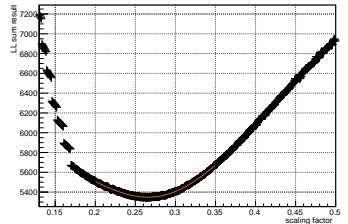
Track type 2



Track type 3

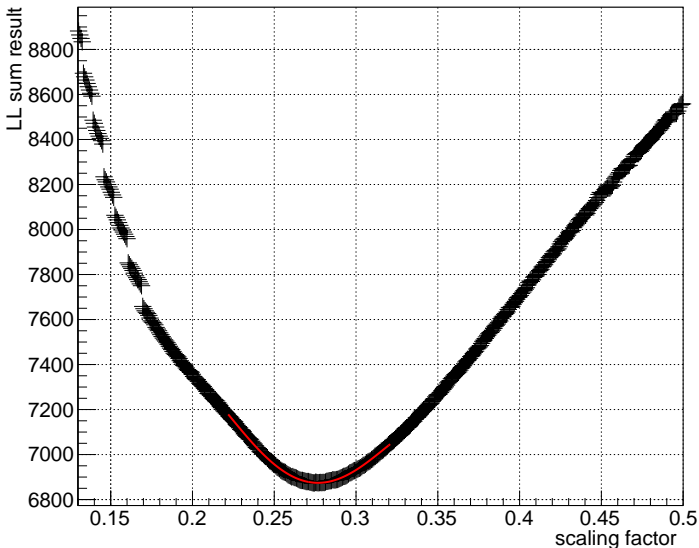


Track type 4



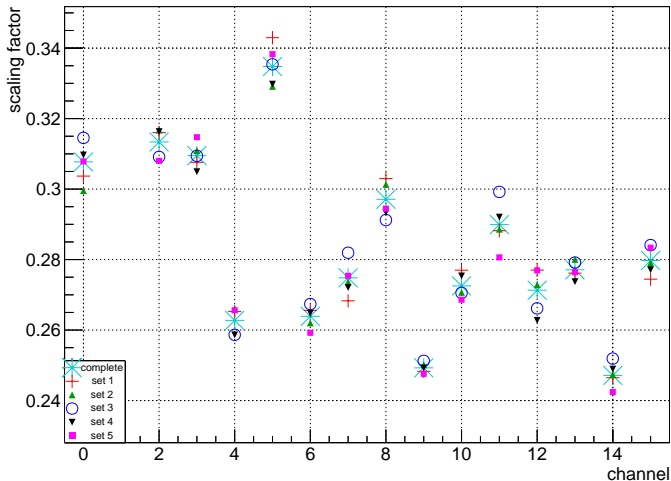
Combine all tracktypes with realistic statistics

LL sum for TT 0 up to TT 4



3 days of data taking

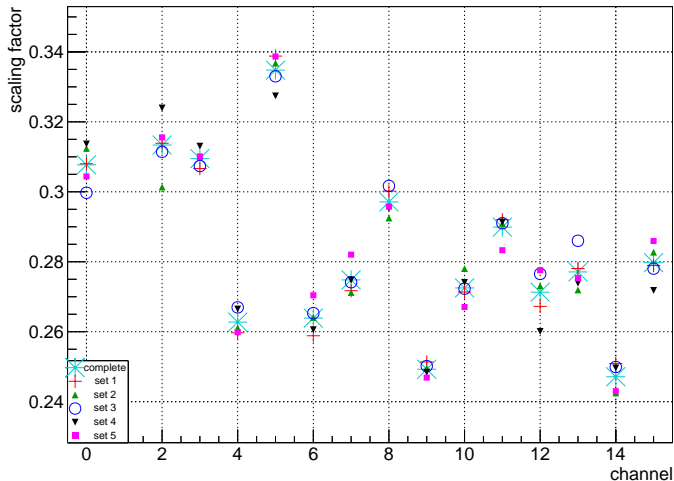
Scaling factors for LL summation of TT 0 up to TT 4



Relative deviation of up to 6 percent

3 days of data taking - Sequential Spread

Scaling factors for LL summation of TT 0 up to TT 4



Relative deviation of up to 6 percent

Summary

- 3 methods available for determination of pre-calibration
- Method III: LL fit looks promising on low statistics

Outlook

- Get a measure for the error of the calibration factor
- Compare all three Methods for best performance
- Finalise production analysis



Motivation

Different
track types

Analysis

Method I
Method II
Method III

Results

Summary

Thank you for your
attention!